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Prevalence and severity of mental disorders in military personnel:

A standardized comparison with civilians

Mental disorders in military personnel and civilians

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Abstract

Aims

Provision and need for mental health services among military personnel are a major concern across nations. Two recent comparisons suggest higher rates of mental disorders in US and UK military personnel compared to civilians. However, these findings may not apply to other nations. Previous studies have focused on the overall effects of military service rather than the separate effects of military service and deployment. This study compared German military personnel with and without a history of deployment to sociodemographically matched civilians regarding prevalence and severity of twelve-month DSM-IV mental disorders.

Methods

1439 deployed soldiers (DS), 779 never deployed soldiers (NS) and 1023 civilians were assessed with an adapted version of the Munich Composite International Diagnostic interview across the same timeframe. Data were weighted using propensity score methodology to assure comparability of the three samples.

Results

Compared to adjusted civilians, the prevalence of any twelve-month disorder was lower in NS (OR: 0.7 95%CI: 0.5-0.99) and did not differ in DS. Significant differences between military personnel and civilians regarding prevalence and severity of individual diagnoses were only apparent for alcohol (DS: OR: 0.3 95%CI: 0.1-0.6; NS: OR: 0.2 95%CI: 0.1-0.6) and nicotine dependence (DS: OR: 0.5 95%CI: 0.3-0.6; NS: OR: 0.5 95%CI: 0.3-0.7) with lower values in both military samples. Elevated rates of panic/agoraphobia (OR: 2.7 95%CI: 1.4-5.3) and PTSD (OR: 3.2 95%CI: 1.3-8.0) were observed in DS with high combat exposure compared to civilians.

Conclusions

Rates and severity of mental disorders in the German military are comparable to civilians for internalizing and lower for substance use disorders. A higher risk of some disorders is reduced to DS with high combat exposure. This finding has implications for mental health service provision and the need for targeted interventions. Differences to previous US and UK studies that suggest an overall higher prevalence in military personnel might result from divergent study methods, deployment characteristics, military structures and occupational factors. Some of these factors might yield valuable targets to improve military mental health.

Introduction

Mental disorders are strongly related to disability and premature death across various nations (Whiteford et al. 2013). The identification of individuals at high risk for mental disorder is crucial to adequately inform public policy and health care strategies. Numerous studies have shown high rates of common mental disorders such as posttraumatic stress disorder, major depressive disorder and alcohol use disorders in military personnel (Gadermann et al. 2012; Kang & Hyams 2005; Sirratt et al. 2012; Wittchen et al. 2013). However, there is still debate on whether military personnel can be considered as a high risk population, compared to other populations (Hoge et al. 2014; Kessler et al. 2014a). Although stressors related to military service have been linked to an increased risk for mental disorders (Browne et al. 2007; Hoge et al. 2004; Jones et al. 2000), selection and retention criteria could facilitate the selection of resilient individuals. Moreover, there is evidence that only specific subsamples with high risk exposures such as combat experiences, serious accidents and childhood adversities are at elevated risk for morbidity (Jones et al. 2013). In fact, some epidemiological studies suggest that rates of mental disorders in military personnel are comparable to those in the general population (Fear et al. 2010; Klaassens et al. 2008; Riddle et al. 2007). The interpretability of direct comparisons between military and general population studies, however, is restricted since methodology often differs between studies. Moreover, military samples are predominantly male, relatively young and by definition exclude unemployed individuals which can lead to different prevalence estimates compared to the general population (Jacobi et al. 2014; Kessler et al. 2014b). Available data on mental disorders in comparable samples of soldiers and civilians using the same methodology is extremely limited. We are only aware of two studies that used comparable assessment methods as well as a rigorous calibration of military and civilian samples (by means of weighting procedures or statistical adjustments) taking at least differences in sex, age and employment status into account (Goodwin et al. 2015; Kessler et al. 2014b). The first found a generally higher risk for current mental disorders in a large representative US army sample compared to civilians (Kessler et al. 2014b). The second compared common mental disorders between UK serving military personnel and the general working population in the same age range and also observed higher rates in military personnel (Goodwin et al. 2015). These findings may not apply to other nations since there are cross-national differences in risk (e.g. experience of childhood adversities) and resilience factors (e.g. self-efficacy) but also in aspects of system culture (e.g. leadership) and perception of mental illness (e.g.

stigmatization). These factors might be related to mental health (Jones et al., 2012; Kessler et al. 1997; Maciejewski et al., 2000; Rüsch et al., 2005) and result in cross-national differences in rates of mental disorders found in military personnel (Hunt et al. 2014; Sundin et al. 2014). Moreover, it remains unclear whether the differences reported in the abovementioned studies are attributable to military service in general or to previous deployments since comparisons were made with the entire representative military samples including both previously deployed and never deployed soldiers. This study presents data on the 12-month prevalence and severity of DSM-IV mental disorders from a sample of German deployed soldiers (DS), a comparable sample of never deployed soldiers (NS) and sociodemographically matched civilians.

Methods

Samples

Data for the DS and NS were taken from the Prevalence, Incidence and Determinants of Post Traumatic Stress and Other Mental Disorders-study (Wittchen et al. 2012a). The DS sample was drawn from a reference population of 9617 soldiers who were deployed to Afghanistan as part of the 20th and 21st contingents of the German International Security Assistance force (ISAF) mission in 2010. Power calculations indicated that sufficient determination of prevalence rates could be achieved with a 36% (n = 3493) sample of the total of 9617 soldiers, with assumed non-eligibility and refusal rates. The random sample was stratified, oversampling combat personnel as an assumed high-risk population. Of the 3493 DS, 1599 met eligibility criteria. To be classified as eligible, soldiers had to be at least 18 years old and had to be present at their home base location during the assessment periods. Moreover, only locations with a sufficient high number of eligible soldiers (n=50) could be considered due to logistical and financial constraints. Examination of medical records revealed no evidence that non-eligible subjects differed from those being eligible regarding the prevalence of mental health problems (Wittchen et al. 2012a). Of all eligible soldiers, 102 refused participation, 7 did not show up at the scheduled assessment and 7 provided incomplete data. The final DS sample consisted of 1483 soldiers (response rate 92.8%). For the NS sample, 1758 soldiers were drawn from the same home base locations. Eligibility criteria were being at least 18 years old (as in the DS sample) and having never been deployed. From 932 soldiers being eligible, 40 refused participation and 7 provided incomplete data. The final NS sample consisted of 889 soldiers (response rate 95.4%). For this study, all female soldiers (DS: 44, NS: 110) were excluded because these low numbers would not allow meaningful analyses.

For the civilian sample, a subsample was taken from the mental health module of the German Health Interview and Examination Survey for Adults, a representative examination of physical and mental health in the German adult general population (age 18-79). Design and methods of the mental health module of this survey are described elsewhere (Jacobi et al. 2013). A total sample of 8152 was drawn for the main survey from local population registries. For the mental health module, 6027 met the eligibility criteria (aged between 18 and 79, completed assessment in the main survey, informed consent for the mental health supplement, sufficient language skills, being available during the

assessment period). Of all eligible subjects, 527 refused participation, 197 could not be scheduled for assessment and 820 provided only partial information, resulting in a sample of 4483 subjects (response rate 74.4%). To assure comparability with the military samples, females, individuals older than 57 years and those not currently employed were excluded making a subsample of 1023 civilians available for analyses. Further adjustment of these samples according to sociodemographic variables is described below.

Insert Table 1 about here

Data collection

In the military study, data were collected by non-military trained interviewers, dispatched to soldiers' home bases. Soldiers were informed about the study approximately two months in advance to arrival of the study team via personal written invitation. Participation was strictly voluntary and confidential. All eligible soldiers were released from their routine duty irrespective of willingness to participate. Thus, participation was solely decided by the individual soldier directly before the scheduled interview without knowledge of their leaders. DS and NS were examined in parallel at their home bases. In the general population survey, interviews were conducted by clinically trained interviewers either at the respondent's home, at local study centers or at another place of the participant's choice if neither home or study center were suitable. Interviews were conducted in strict confidentiality. All participants provided informed consent and the study procedure was approved by the TUD Ethics Board (EK 72022010).

Diagnostic assessment

The Munich-Composite International Diagnostic Interview (DIA-X/M-CIDI) (Wittchen & Pfister 1997) was used in both studies. The DIA-X/M-CIDI allows the standardized assessment of symptoms, syndromes and diagnoses according to the criteria of DSM-IV-TR (American Psychiatric Association, 2000). The reliability and validity of the study instrument has been demonstrated in various studies (Lachner et al. 1998; Reed et al. 1998; Wittchen et al. 1998). For the purposes of this study we reported 12-month internalizing disorders and substance use disorders (SUD), of which some disorders were grouped together because of small case numbers. Internalizing disorders included panic disorder/ agoraphobia, posttraumatic stress disorder (PTSD), phobias (social phobia, specific

phobia, other anxiety disorders (obsessive compulsive disorder (OCD), generalized anxiety disorder (GAD)) major depressive disorder and bipolar disorder. SUD included alcohol abuse, alcohol dependence and nicotine dependence. Other disorders were either not assessed (e.g. attention-deficit/hyperactivity disorder, intermittent explosive disorder) or were too rare in at least one of the studies to permit meaningful analyses (e.g. psychotic disorders, SUD related to illicit or prescribed substances) (Trautmann et al. 2014; Wittchen et al. 2013).

Sociodemographic and military career variables

Sociodemographic variables that were assessed in both studies were age, marital status (married, unmarried), and education (low: 8th grade, middle: 10th grade, high: high school). Military career variables considered here to describe the military samples included rank (enlisted, non-commissioned officer, commissioned officer), unit (combat, medical, combat support) and number of deployments. The distributions of sociodemographic variables for the DS, NS and the civilian sample are shown in Table 1. For more detailed analyses in DS, the number of combat experiences was also assessed using the respective list of events of the Mental Health Advisory Team (Mental Health Advisory Team (MHAT IV) 2006) which includes 33 different events ranging from rather mild (e.g. seeing destroyed homes and villages) to severe events (e.g. being wounded or injured). DS experienced on average 6.9 (SD=6.1) combat events. Detailed information on type and exposure for each single event is provided elsewhere (Wittchen et al., 2012b). DS were then categorized into DS with low combat exposure (3 or less events, 38.2%) and DS with combat events (more than 3 events, 61.8%).

Severity of mental disorders

The presence of comorbid disorders and self-rated impairment (for internalizing disorders), as well as the number of reported symptoms (for SUD), were used as measures of disorder severity. For the assessment of impairment, respondents rated how much their daily life and activities were impaired by the symptoms of the respective disorder on a five-point scale ranging from 0 (no impairment) to 4 (very severe impairment). This item was also used to represent the impairment criteria (at least moderate impairment) of several DSM diagnoses in the CIDI diagnostic algorithms. This resulted in a low variance of disorder severity. Thus, the threshold for impairment in the diagnostic algorithm was lowered (at least mild impairment) for all analyses including the severity of internalizing disorders. The severity of alcohol use disorders (AUD) and nicotine dependence was defined as the total number of

symptoms that were endorsed. This measure of severity of SUD is in accordance with the approach that was introduced in DSM-5 (Hasin et al. 2013).

Statistical analysis

We used weighting procedures to achieve a) the representativeness of the DS sample for the reference population (N=9617), and the comparability of b) the NS with the DS sample and c) the civilian sample with the DS sample. The weighting procedure is described in detail in the online supplementary material.

Insert online supplementary material “sample weighting” and Table 1 about here

For the comparison of both military samples with the civilian sample, logistic, multinomial logistic and linear regressions were applied for binary, multi-categorical and dimensional outcomes, respectively. For counted outcomes (i.e. the number of reported symptoms), negative binomial regressions were applied. Comparisons between DS and the civilian sample were always conducted for the total DS sample as well as separately for DS with low and high combat exposure since there is evidence that DS with high combat exposure have a higher risk for mental disorders (Iversen et al. 2008; Jacobson et al. 2008). Since differences in demographic characteristics between the three comparison groups could not be neutralized completely (see Table 1), we conducted a sensitivity analysis where we re-analyzed differences between groups adjusting for age and marital status. All regressions used the robust Huber-White sandwich estimator for statistical inference in weighted data (Royall 1986). Associations were quantified with odds ratios (ORs) for logistic and multinomial logistic and with incidence rate ratios (IRRs) for negative binomial regressions. Statistical significance was assessed at the 5% level (two-sided tests). All analyses were conducted with Stata 12.1. (Stata Corp. 2012).

Results

Prevalence of twelve-month mental disorders

The prevalence of any twelve-month mental disorder was lower in NS (14.4%) compared to civilians (20.0%; OR: 0.7 95%CI: 0.5-0.99) but was not significantly different in DS (16.6%). Compared to civilians, NS had a lower probability of meeting criteria for alcohol (OR: 0.2 95%CI: 0.1-0.6) and nicotine dependence (OR: 0.5 95%CI: 0.3-0.7) but there were no differences regarding the prevalence of internalizing disorders. DS had a lower prevalence of any other anxiety disorder (OCD, GAD) (OR: 0.4 95%CI: 0.2-0.6), alcohol (OR: 0.3 95%CI: 0.1-0.6) and nicotine dependence (OR: 0.5 95%CI: 0.3-0.6) compared to civilians. The prevalence of all other specific diagnoses did not differ significantly between the military samples and civilians (Table 2). When differences between DS and civilians were analyzed separately for DS with low and high combat exposure, DS with high combat exposure had a higher prevalence of panic/agoraphobia (OR: 2.7 95%CI: 1.4-5.3) and PTSD (OR: 3.2 95%CI: 1.3-8.0) while DS without combat exposure had a lower prevalence of any mood disorder (OR: 0.5 95%CI: 0.4-0.8) compared to civilians. All other patterns of results were similar for DS with low and high combat exposure (Table S1). A sensitivity analysis adjusting for age and marital status showed the same differences between the three groups and estimates of associations were almost identical (data available on request).

Insert Tables 2 and S1 about here

Severity of twelve-month mental disorders

We analyzed differences between military samples and civilians regarding comorbidity, self-rated impairment (for internalizing disorders) and number of reported symptoms (for SUD) as measures of disorder severity (Table 3). For internalizing disorders, logistic regressions revealed higher proportions of severe cases of anxiety disorders compared to civilians only among NS (OR: 5.4 95%CI: 1.7-17.5). For SUD, the number of reported symptoms in individuals with ND was lower in both military samples (DS: IRR: 0.8 95%CI: 0.7-0.8; NS: IRR: 0.7 95%CI: 0.6-0.7) and it was also lower in individuals with AUD in the DS sample (IRR: 0.7 95%CI: 0.6-0.9) compared to civilians. DS with low and high combat exposure showed a similar pattern of results compared to civilians regarding the severity of mental disorders except that DS with low combat exposure had a lower proportion of moderate cases of

anxiety disorders compared to civilians (OR: 0.3 95%CI: 0.1-0.9) which was not found for DS with high combat exposure (Table S2). Adjusting for age and marital status did not affect these results.

Insert Table 3 and S2 about here

Discussion

This study compared military personnel with and without a history of deployment and sociodemographically comparable civilians regarding the prevalence and severity of twelve-months DSM-IV mental disorders. The study is among the few that have been able to conduct a standardized comparison of military and civilian samples across the same timeframe using identical assessment methods. We found rather similar rates for internalizing disorders and lower rates for SUD in both military samples compared to civilians. The same pattern was observed for measures of disorder severity where we found a lower severity of SUD and a comparable severity of most internalizing disorders. Elevated rates among military personnel compared to civilians were only found for DS with high combat exposure and this was restricted to panic/agoraphobia and PTSD.

These findings differ to the US and the UK comparisons which found overall higher rates of mental disorders in military personnel compared to civilians (Goodwin et al. 2015; Kessler et al. 2014b). Findings also differ from previous UK data suggesting higher rates of alcohol misuse in the military compared to the general population, although this study only stratified by gender and age (Fear et al. 2007). There are several possible reasons for these divergent findings.

First, there are noteworthy differences in design and methods employed in this study compared to those reported by Kessler et al. (2014b) and Goodwin et al. (2015). Military samples in these studies were representative of the serving military. The DS sample which was used as reference for the calibration of both NS and civilians was only representative of two ISAF contingents. Selection mechanisms that led to the assignment to these contingents might have led to different prevalences of mental disorders than would have been observed in the entire serving military. Moreover, the UK study used a self-report instrument (General Health Questionnaire) and the US study used a self-administered version of the CIDI as well as the Posttraumatic stress disorder Checklist for the assessment of mental disorders instead of structured interviews that were employed in this study. However, this is unlikely to explain any cross-study differences since military and civilian samples were always assessed with the same instruments so potential bias would apply to both populations.

Second, there are differences in deployment characteristics and the military structure between Germany, UK and the US in terms of tour length, preparation and involvement in combat events (Trautmann et al. 2013; Wittchen et al. 2012b; Zimmermann et al. 2014) which might result in an overall lower degree of exposure to stressful experiences in German deployed personnel. This might explain why we found no elevated rates of mental disorders in deployed personnel compared to civilians. However, an overall effect of deployment on mental health only exists for the US but not for the UK military (Sundin et al. 2014) suggesting that these deployment characteristics might only explain the differences between the present study and the study of Kessler et al. (2014b) which included a high proportion of previously deployed personnel. Moreover, the US and UK military might differ from the German forces in terms of recruitment, career mechanisms, regulations and the availability and accessibility of supportive resources including mental health services. In particular, the lower rates of SUD in the German military compared to civilians might be the result of strict regulations regarding substance use (at least for alcohol use) and earlier treatment seeking compared to civilians, probably mediated by disciplinary measures in case of substance-related offenses and the corrective influence of the military unit (Zimmermann et al. 2012). Alternatively, differences in cultures between militaries with regard to substance use might also be relevant.

Third, both Kessler et al. (2014b) and Goodwin et al. (2015) argue that predisposing vulnerability factors for the development of mental disorders (e.g. parental psychopathology (Knappe et al. 2009), early adverse experiences (Kessler et al. 1997)) might be more common in military personnel compared to civilians which could be the result of self-selection processes (Goodwin et al. 2015; Kessler et al. 2014b). If this was the case, our findings would suggest that this self-selection of vulnerable individuals into military service might exist to a lesser extent in the German military or that military selection and attrition processes might counteract these effects.

Finally, divergent findings compared to previous studies might be the result of cross-national differences in occupational cultures in general. Nations vary considerably in occupational factors such as working conditions, occupational health and safety systems as well as prevention and compensation approaches to work-related health problems which might be related to the prevalence of mental disorders in the working population (World Health Organization 2012). Another specific occupational aspect might be an over-reporting of mental health symptoms in studies which have been

specifically designed to target an individual occupational group such as military personnel (Goodwin et al. 2015; Goodwin et al. 2013). In addition to putative effects of assessment procedures which can impact on this response bias (self-report questionnaire vs structured interviews), one might speculate that German military personnel are less likely to endorse sensitive private information such as mental health symptoms than US and UK military personnel. This could be explained by perceived roles, stigmatization or suspected disadvantages related to disclosure of mental disorder which could differ between the German military and other forces. In summary, there are several putative reasons for differences in military-civilian comparison between the present German study and recent US and UK findings which might be fruitful targets for future research.

Beyond differences to previous US and UK comparisons we observed two more specific findings that might have implications for service provision and intervention. First, elevated rates of mental disorders among DS compared to civilians were only found for PTSD and panic/agoraphobia. This is in line with research showing particularly strong relations between traumatic event exposure and these mental disorders (Ayazi et al., 2014) which should be considered when screening for deployment-related mental health problems. Second, we found more severe cases of anxiety disorders in the NS sample compared to civilians. This might reflect a reduced recognition and treatment allocation of at least some anxiety disorders in the population of NS which warrants further investigation.

This study has some limitations. The DS sample was representative for two contingents of deployed soldiers and does not represent the entire deployed population in the German forces. However, we have no evidence that these contingents differ considerably from others. In addition, we cannot rule out the possibility of an underreporting, especially for SUD. However, this would only mask differences between soldiers and the general population if this occurred to a higher extent in soldiers. Besides, previous studies have shown that the used interview and its confidential administration allows a valid estimation of prevalence rates for SUD (Kessler et al. 1998; Lachner et al. 1998). We were also not able to assess females in this study because of the low number in the German military. Finally, interpretations regarding differences between military personnel and civilians have still to be done with caution since even a careful calibration of samples cannot consider all putatively relevant variables.

Conclusion

The findings of this study suggest that rates and severity of mental disorders are similar or even lower in the German military compared to sociodemographically matched civilians, irrespective of deployment. The concentration of available resources on an improved identification and care for high-risk subgroups, particularly among deployed personnel with high combat exposure, might therefore be the most appropriate strategy. Differences to comparisons from the US and the UK, which observed higher rates of mental disorders in the military, might be explained by differences in study methods, deployment characteristics, military structures, self-selection processes and mental health in the working population. The findings of this study might apply to other nations (e.g. Netherlands, Australia) which report prevalence rates of mental disorders that are similar to those in the German military (Reijnen et al. 2015; Hodson et al. 2011). Whilst the suggested methodological explanations for divergent findings should be considered in the conduct and interpretation of future studies, differences in recruitment strategies, selection processes and disclosure of mental disorder might be promising targets for further investigation of these mechanisms and the role they may have in determining military mental health.

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Ethical Standards

The study was approved by the TUD Ethics Board (EK 72022010), after internal Bundeswehr approval, and was performed according to ICH-GCP (Good Clinical Practice)-Guidelines.

Conflict of interest

HUW is member of advisory boards and received grant support and travel compensation by Servier, Lundbeck, Novartis, Pfizer, and Sanofi which could be perceived as a potential conflict of interest. PZ is employed by the German Armed Forces. His employment had no influence on the study design; the collection, analysis and interpretation of data. All other authors declare that they have no conflict of interests.

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Table 1. Distribution of sociodemographic and military career variables in deployed soldiers, never deployed soldiers and civilians

	Military						Civilians		
	Deployed (n=1439)			Never deployed (n=779)			(n=1023)		
	n	%	%w*	n	%	%w*	n	%	%w*
<i>Demographic</i>									
Age									
<25	383	26.6	19.4	423	54.3	27.8	82	8.0	19.7
25-29	537	37.3	37.1	237	30.4	37.1	82	8.0	35.2
30-39	342	23.8	27.3	59	7.6	18.7	239	23.4	28.8
>39	177	12.3	16.2	60	7.7	16.3	620	60.6	16.3
Marital status									
Married	445	30.9	36.2	132	16.9	29.1	604	59.0	30.3
Unmarried	994	69.1	63.8	647	83.1	70.9	419	41.0	69.7
Education									
Low	271	18.8	16.3	162	20.8	17.9	198	19.4	15.3
Middle	927	64.4	65.6	472	60.6	62.1	583	57.3	65.3
High	241	16.7	18.1	145	18.6	20.0	237	23.3	19.4
<i>Military career</i>									
Rank									
Enlisted	524	36.4	24.8	208	26.7	33.1			
Non-commissioned officer	767	53.3	62.1	497	63.8	55.7			
Commissioned officer	148	10.3	13.1	74	9.5	11.3			
Unit									
Combat	674	46.8	23.8	166	21.3	23.3			
Medical	61	4.2	5.9	55	7.1	8.0			
Combat support	704	48.9	70.3	558	71.6	68.7			

%w=weighted percentage

*weights were used to assure (1) representativeness of the deployed sample for the reference population taking into account oversampling of combat units, eligibility and response according to rank, unit and location, (2) comparability of the deployed with the never deployed sample according to rank, unit, operational area, gender, age, educational level, number of years spent at school and having children, and (3) comparability of the general population sample with both military samples with regard to age, sex and marital status (individuals who were not employed were excluded from the general population sample)

Table 2. Twelve-months prevalence of DSM-IV mental disorders in deployed soldiers, never deployed soldiers and civilians

	Military samples			Differences	
	Deployed	Never deployed	Civilians	Deployed vs civilians	Never deployed vs civilians
	(n=1439) % (95%CI)	(n=779) % (95%CI)	(n=1023) % (95%CI)	OR (95%CI)	OR (95%CI)
Any disorder ^a	16.6 (14.6-18.9)	14.4 (11-18.7)	20.0 (16.4-24.3)	0.8 (0.6-1.1)	0.7 (0.5-0.99)
No of diagnoses ^a					
0	83.4 (81.1-85.4)	85.6 (81.3-89.0)	80.0 (75.7-83.6)	1.0	1.0
1	8.1 (6.7-9.7)	7.7 (5.1-11.6)	10.7 (8.0-14.1)	0.7 (0.5-1.1)	0.7 (0.4-1.2)
2	5.6 (4.4-7.1)	4.7 (3.1-7.2)	6.8 (4.6-9.9)	0.8 (0.5-1.3)	0.6 (0.4-1.2)
3	1.8 (1.2-2.7)	0.9 (0.3-2.1)	1.1 (0.5-2.2)	1.6 (0.7-3.8)	0.8 (0.2-2.4)
4	1.2 (0.7-2.0)	1.1 (0.4-2.5)	1.5 (0.7-3.2)	0.8 (0.3-2.0)	0.7 (0.2-2.1)
Internalising disorders					
Anxiety disorders					
Panic/Agoraphobia	5.3 (4.2-6.7)	1.8 (0.9-3.4)	3.1 (1.7-5.5)	1.7 (0.9-3.3)	0.6 (0.2-1.4)
PTSD	2.8 (2.0-4.0)	1.2 (0.5-2.6)	1.4 (0.6-3.3)	2.0 (0.8-4.9)	0.8 (0.3-2.6)
Phobias	5.7 (4.5-7.1)	6.2 (4.3-9.0)	6.5 (4.5-9.4)	0.9 (0.5-1.4)	0.9 (0.5-1.7)
Other anxiety disorders	1.9 (1.2-2.8)	2.8 (1.3-5.8)	5.1 (3.4-7.6)	0.4 (0.2-0.6)	0.5 (0.2-1.3)
Any anxiety disorder	12.1 (10.3-14.1)	9.8 (7.1-13.5)	12.7 (9.8-16.3)	0.9 (0.7-1.3)	0.8 (0.5-1.2)
Mood disorders					
Major depressive disorder	3.4 (2.5-4.6)	2.2 (1.1-4.1)	4.2 (2.6-6.5)	0.8 (0.5-1.4)	0.5 (0.2-1.1)
Bipolar disorder	1 (0.6-1.8)	1.5 (0.4-5.0)	1.2 (0.5-3.0)	0.9 (0.3-2.5)	1.2 (0.3-5.9)
Any mood disorder	4.4 (3.4-5.8)	3.7 (2.0-6.8)	5.4 (3.6-8.0)	0.8 (0.5-1.4)	0.7 (0.3-1.5)
Substance use disorders					
Alcohol abuse	3.3 (2.5-4.5)	2.3 (1.3-3.9)	4.0 (2.4-6.8)	0.8 (0.4-1.5)	0.6 (0.3-1.2)
Alcohol dependence	1.4 (0.9-2.3)	1.1 (0.5-2.6)	4.6 (2.9-7.2)	0.3 (0.1-0.6)	0.2 (0.1-0.6)
Any alcohol use disorder	3.4 (2.6-4.6)	2.3 (1.3-4.0)	7.6 (5.3-10.8)	0.4 (0.3-0.7)	0.3 (0.1-0.6)
Nicotine dependence	10.7 (9.0-12.6)	11.4 (8.4-15.3)	20.9 (17-25.4)	0.5 (0.3-0.6)	0.5 (0.3-0.7)

Phobias: Social phobia, specific phobia; other anxiety disorders: GAD, OCD; ^awithout nicotine dependence

*weights were used to assure (1) representativeness of the deployed sample for the reference population taking into account oversampling of combat units, eligibility and response according to rank, unit and location, (2) comparability of the deployed with the never deployed sample according to rank, unit, operational area, gender, age, educational level, number of years spent at school and having children, and (3) comparability of the general population sample with both military samples with regard to age and marital status (individuals who were not employed were excluded from the general population sample)

Table 3. Severity of 12-months DSM-IV mental disorders in recently deployed soldiers, never deployed soldiers and civilians

	Internalising disorders		Substance use disorders	
	Anxiety disorder	Mood disorder	AUD	ND
	% (95%CI)	% (95%CI)	mean (SD)	mean (SD)
<i>Recently deployed</i>				
Impairment				
Mild	48.1 (38.5-57.9)	25.7 (15-40.3)		
Moderate	42.9 (33.6-52.8)	56.6 (42.0-70.0)		
Severe	9.0 (4.7-16.5)	17.8 (9.6-30.5)		
No of symptoms			4.4 (2.1) ^a	4.0 (1.4) ^a
<i>Never deployed</i>				
Impairment				
Mild	35.0 (19.8-54.0)	14.9 (3.1-49.1)		
Moderate	44.0 (27.1-62.4)	40.8 (16.2-71.1)		
Severe	21.0 (9.6-40.0) ^a	44.4 (18.1-74.1)		
No of symptoms			5.8 (2.1)	3.5 (0.9) ^a
<i>Civilians</i>				
Impairment				
Mild	47.4 (31.5-63.8)	28.4 (13.1-50.9)		
Moderate	48.0 (31.8-64.5)	36.6 (19.1-58.5)		
Severe	4.7 (2.2-9.4)	35.1 (17.2-58.4)		
No of symptoms			5.9 (3.3)	5.2 (1.4)

Anxiety disorder: any panic disorder, agoraphobia, posttraumatic stress disorder, social phobia, specific phobia, generalised anxiety disorder, obsessive compulsive disorder; mood disorders: any major depressive disorder, dysthymia; AUD = Alcohol use disorder; ND = Nicotine dependence

^asignificant difference compared to civilians (p<.05)

Table S1. Twelve-months prevalence of DSM-IV mental disorders in deployed soldiers with low and high combat exposure compared to civilians

	Military		Civilians (n=1023) % (95%CI)	Differences	
	Deployed with high combat exposure (n=887) % (95%CI)	Deployed with low combat exposure (n=552) % (95%CI)		With combat vs civilian OR (95%CI)	Without combat vs civilian OR (95%CI)
Any disorder ^a	21.3 (18.3-24.6)	11.9 (9.3-15.0)	20.0 (16.4-24.3)	1.1 (0.8-1.5)	0.5 (0.4-0.8)
No of diagnoses ^a					
0	78.7 (75.4-81.7)	88.1 (85.0-90.7)	80.0 (75.7-83.6)	1.0	1.0
1	11.4 (9.2-14.1)	4.6 (3.1-6.8)	10.7 (8-14.1)	0.9 (0.6-1.4)	0.4 (0.2-0.7)
2	5.5 (4.0-7.5)	5.7 (4.0-8.2)	6.8 (4.6-9.9)	0.8 (0.5-1.4)	0.8 (0.4-1.3)
3	2.5 (1.6-4.0)	1.1 (0.5-2.5)	1.1 (0.5-2.2)	2.0 (0.8-5.1)	0.9 (0.3-2.8)
4	1.9 (1.1-3.3)	0.4 (0.1-1.7)	1.5 (0.7-3.2)	0.7 (0.2-2.1)	0.3 (0.1-1.3)
Internalising disorders					
Anxiety disorders					
Panic/Agoraphobia	8.1 (6.2-10.5)	2.4 (1.3-4.1)	3.1 (1.7-5.5)	2.7 (1.4-5.3)	0.8 (0.3-1.7)
PTSD	4.4 (3.0-6.4)	1.2 (0.5-2.6)	1.4 (0.6-3.3)	3.2 (1.3-8)	0.8 (0.2-2.6)
Phobias	6.3 (4.7-8.5)	5.0 (3.4-7.3)	6.5 (4.5-9.4)	1.0 (0.6-1.6)	0.8 (0.4-1.3)
Other anxiety disorders	2.5 (1.5-4.1)	1.2 (0.5-2.6)	5.1 (3.4-7.6)	0.5 (0.2-0.9)	0.2 (0.1-0.6)
Any anxiety disorder	15.8 (13.2-18.9)	8.2 (6.1-11.0)	12.7 (9.8-16.3)	1.3 (0.9-1.9)	0.6 (0.4-0.9)
Mood disorders					
Major depressive disorder	4.5 (3.1-6.4)	2.3 (1.3-4.0)	4.2 (2.6-6.5)	1.1 (0.6-2)	0.5 (0.3-1.1)
Bipolar disorder	1.5 (0.8-2.8)	0.5 (0.2-1.7)	1.2 (0.5-3)	1.3 (0.4-3.9)	0.4 (0.1-1.9)
Any mood disorder	6.0 (4.4-8.1)	2.8 (1.7-4.7)	5.4 (3.6-8)	1.1 (0.7-1.9)	0.5 (0.3-1.0)
Substance use disorders					
Alcohol abuse	3.7 (2.6-5.3)	3.0 (1.8-4.9)	4.0 (2.4-6.8)	0.9 (0.5-1.8)	0.7 (0.3-1.5)
Alcohol dependence	1.5 (0.8-2.7)	1.3 (0.6-2.9)	4.6 (2.9-7.2)	0.3 (0.1-0.7)	0.3 (0.1-0.7)
Any alcohol use disorder	3.9 (2.8-5.6)	3.0 (1.8-4.9)	7.6 (5.3-10.8)	0.5 (0.3-0.9)	0.4 (0.2-0.7)
Nicotine dependence	11.7 (9.4-14.4)	9.5 (7.2-12.4)	20.9 (17.0-25.4)	0.5 (0.4-0.7)	0.4 (0.3-0.6)

Phobias: Social phobia, specific phobia; other anxiety disorders: GAD, OCD; ^awithout nicotine dependence

Table S2. Severity of 12-months DSM-IV mental disorders in soldiers with low and high combat exposure compared to civilians

	Internalising disorders		Substance use disorders	
	Anxiety disorder	Mood disorder	AUD	ND
	% (95%CI)	% (95%CI)	mean (SD)	mean (SD)
<i>Deployed with high combat exposure</i>				
Impairment				
Mild	39.3 (28.8-51.0)	26.4 (14.1-43.8)		
Moderate	52.9 (41.4-64.1)	57.1 (40.1-72.6)		
Severe	7.8 (3.5-16.3)	16.5 (8.1-30.7)		
No of symptoms			4.5 (2.1) ^a	4.0 (1.4) ^a
<i>Deployed with low combat exposure</i>				
Impairment				
Mild	67.6 (47.5-82.9)	24.2 (6.9-58.1)		
Moderate	20.7 (9.0-40.6) ^a	55.3 (26.4-81.0)		
Severe	11.7 (3.6-31.9)	20.5 (5.4-53.7)		
No of symptoms			4.2 (2.1) ^a	3.9 (1.4) ^a
<i>Civilians</i>				
Impairment				
Mild	47.4 (31.5-63.8)	28.4 (13.1-50.9)		
Moderate	48.0 (31.8-64.5)	36.6 (19.1-58.5)		
Severe	4.7 (2.2-9.4)	35.1 (17.2-58.4)		
No of symptoms			5.9 (3.3)	5.2 (1.4)

Anxiety disorder: any panic disorder, agoraphobia, posttraumatic stress disorder, social phobia, specific phobia, generalised anxiety disorder, obsessive compulsive disorder; mood disorders: any major depressive disorder, dysthymia; AUD = Alcohol use disorder; ND = Nicotine dependence

^asignificant difference compared to civilians (p<.05)

Online material - Sample weighting

Weighting procedures were used to achieve a) the representativeness of the DS sample for the reference population (N=9617), and the comparability of b) the NS with the DS sample and c) the civilian sample with the DS sample. In a) post-stratification weights were used to account for differences that occurred due to the joint effects of sampling, eligibility, and response. Ten strata were defined, eight among males (all possible combinations of combat vs non-combat units, rank high vs. low and deployment location (Kunduz vs other)) and two among females (Kunduz vs other location). These ten strata were defined as a trade-off between all information we had on the source population (24 strata would have been possible) and ensuring a sufficient number of cases per stratum for stable estimates. The weights in the DS sample were then calculated on the basis of the inverse sample versus reference population frequency count per stratum. For b) the following military and demographic characteristics were considered: rank, unit, number of years in service, operational area (army, air force, basic fighting, forces, marine, medical), marital status, gender, age (linear, squared and cubic terms vs. four categories), educational level and having children. We used the propensity score method based on logistic regression (Kurth et al. 2005) with the outcome deployment status (DS versus NS) to adjust the NS sample to the weighted DS sample in a). After testing for interactions, backward selection of main effects and interaction terms, fitting different alternative models (e.g. age dimensional vs. age categorical) and inspecting the balance of the weighted marginal distributions of the variables between DS and NS, we chose the model that included the following main effects: rank (2 dummy variables), years of deployment, operational area (4 dummy variables), combat unit (2 dummy variables), gender, age (3 dummy variables representing 4 categories), educational level (2 dummy variables), having children and family status (3 dummy variables) (Wittchen et al. 2012a). With the associated model-based probabilities for DS (propensity score), a categorization into 5 blocks turned out to yield the best balance of all variables considered. The weights in the NS sample were then based on the NS to DS ratios of the relative frequencies of these blocks (DS weighted as in a)), and the PSCORE command in Stata (Stata Corp. 2012) was used. For this publication, we omitted 154 females (110 in DS and 54 in NS). Note that the weights are still valid in the subsample of male soldiers since a) was done conditional on gender and in b) interactions with gender in predicting DS versus civilian sample were investigated but not found, suggesting that the predictive values of variables other than gender did not depend on gender. For c) the same propensity score method was used, but we did not have the military characteristics for adjustment, nor had all demographic variables

been collected in the same way in the civilian sample. Age and marital status could be used for this comparison. The propensity score was based on the model predicting DS versus civilians with the linear age term and marital status main effects (squared age and interaction terms were not significant), and was categorized into 6 blocks for the best balance.